

## Building Blocks for Climate Smart Agriculture and Forestry

On April 23, 2015, USDA Secretary Vilsack announced the USDA Building Blocks for Climate Smart Agriculture and Forestry. This plan was designed to assist farmers, ranchers, forest landowners, and rural communities respond to climate change. The framework consists of ten "building blocks" that span a range of technologies and practices to reduce greenhouse gas emissions, increase carbon storage, and generate clean renewable energy.

USDA has a long history of cooperative conservation and partnerships with farmers, ranchers, and forest land owners. The principles that have guided USDA's cooperative conservation efforts also apply to each of these building blocks, and actions taken through this initiative will be:

- **Voluntary and incentive-based:** Farmers, ranchers, and forest landowners are stewards of the land. USDA has a track record of successful conservation through voluntary programs designed to provide technical assistance for resource management. These efforts fit within USDA's approach of "cooperative conservation."
- **Focused on multiple economic and environmental benefits:** To be successful, the proposed actions should provide economic and environmental benefits through efficiency improvements, improved yields, or reduced risks.
- **Designed to meet the needs of producers:** This strategy is designed for working farms, ranches, forests, and production systems. USDA will encourage actions that enhance productivity and improve efficiency.
- **Cooperative and focused on building partnerships:** USDA will seek out opportunities to leverage efforts by industry, farm groups, conservation organizations, municipalities, public and private investment products, tribes, and states.
- **Assess progress and measure success:** USDA is committed to establishing quantitative goals and objectives for each building block and will track and report on progress.

Through this comprehensive set of voluntary programs and initiatives USDA expects to reduce net emissions and enhance carbon sequestration by over 120 million metric tons of CO<sub>2</sub> equivalent (MMTCO<sub>2</sub>e), about 2% of economy-wide net greenhouse emissions per year by 2025. This is equivalent of taking 25 million cars off the road, or offsetting the emissions produced by powering nearly 11 million homes last year.

USDA has embarked on the development of the implementation plans in an integrative approach for each of the ten building blocks. These plans outline the execution of actions, deliverables and guidance under the proper authorities. They include interagency collaborations, partnerships and metrics to accurately capture and monitor data.

## Building Block Goals

Building Block	Goals by Year 2025
<b>Soil Health</b>	Integrate with the NRCS Soil Health Initiative and promote more than ten NRCS conservation practices that improve soil organic matter, reduce emissions from soils and equipment, and promote healthier soils nationwide
<b>Nitrogen Stewardship</b>	Through 4 “R’s” reduce nitrous oxide emissions and provide cost savings
<b>Livestock Partnerships</b>	Install 500 anaerobic digesters; install impermeable covers on 10% of dairy cattle and swine operations
<b>Conservation of Sensitive Lands</b>	Enroll 400,000 acres of CRP with high GHG benefits; protect 40,000 acres through easements; transfer expiring CRP acres to permanent easements
<b>Grazing and Pasture Lands</b>	Establish grazing management plans on an additional 9 M acres for a total of 27 M acres by 2025.
<b>Private Forest Growth and Retention</b>	Through Forest Legacy Program and Community Forest Program, protect almost 1 M acres of environmentally important private forestland from conversion
<b>Stewardship of Federal Forests</b>	Reforest 32,000 acres per year on National Forest System lands (baseline)
<b>Promotion of Wood Products</b>	Increase the number of building projects supported through technical assistance from 280 in 2014 to 2,000 in 2025
<b>Urban Forests</b>	Plant 100,000 additional trees in urban areas
<b>Energy Generation and Efficiency</b>	Promote renewable energy technologies and improve energy efficiency through EECLP, REAP, NOFEI (EQIP), and RHS programs.

## **Soil Health**

Land use and management can build or reduce soil carbon depending on the particular management practices used. As a result, opportunities for GHG mitigation in agriculture include encouraging practices that increase soil carbon, discouraging those that reduce soil carbon and soil organic matter and decrease erosion of carbon-rich topsoil. Additionally, soil health management systems (SHMS, or suites of soil health promoting practices) and improved soil health status can contribute to reductions in net CO<sub>2</sub> and N<sub>2</sub>O emissions, both directly on farm and indirectly through, for example, reductions in inputs and fuel usage.

**Goal: Reduce annual emissions by 4-18 Million Metric Tons of CO<sub>2</sub> Equivalent (MMTCO<sub>2</sub>e) by 2025 through NRCS influences on Soil Health Management Practices implemented by land managers in the US.**

### **Primary Agencies**

**NRCS:** NRCS technical assistance, conservation planning, and conservation practice standards inform users on proper practice implementation. Incentives are available through cost-sharing implementation of practices (such as Residue and Tillage Management, No-Till (329), Residue and Tillage Management, Reduced Tillage (345), Cover Crop (340), Grassed Waterways (412), Vegetative Barriers (601), Herbaceous Wind Barriers (603), and other NRCS conservation practices. With the initiation of the new Soil Health Division in 2014, programs will be further targeted to meet the needs in soil health management planning and implementation over the coming years.

**ARS:** ARS National Climate Change, Soils, and Emissions Program has as its mission “to improve the quality of atmosphere and soil resources affected by, and having an effect on agriculture, and to understand the effects of, and prepare agriculture for, adaptation to climate change.” Research includes quantifying effects of agricultural practices/systems on soil carbon sequestration, soil greenhouse gas emissions, and soil health indicators. ARS also maintains a publicly accessible database repository of agricultural greenhouse gas data, including ancillary data such as soil properties, weather, and management practices (GRACEnet).

**NIFA:** Provides technical and financial assistance to the Land Grant Universities and others to conduct research, education, and extension activities in agroecosystems (including forest and rangelands) to facilitate the reduction of GHG emissions.

## **Work Plan**

1. ***Soil health training, education, outreach.*** Continued awareness training for all stakeholders, and advanced level Soil Health Management Planning and Implementation Training to build capacity for more effective work force.
2. ***Soil health assessment.*** Standardization of soil health assessments will be pursued in collaboration with research entities, public/private labs, and other partners. Such soil testing needs to become publicly readily available, affordable, and commercially viable, while remaining science-based and standardized such that it can be integrated into effective NRCS programming. Cost-sharing and leveraging of existing projects is being pursued to build a national dataset including multiple existing soil health assessments. This will be used to adjust interpretation of assessments as needed for regional differences, so that appropriate recommendations for managing soil health constraints can be developed, similarly to how nutrient testing informs nutrient management.
3. ***Soil health management planning.*** An institutionalized, cost-shared process for soil health management planning (SHMP) needs to be integrated into the NRCS conservation planning process. Planners can then guide producers to assess and understand their soil health status, and to choose and adapt science-based soil health management systems to their farms. Such systems must be designed to target identified soil health constraints, and transition management to a soil health regenerating and maintaining system of practices.
4. ***Soil health management implementation.*** Soil health division staff will be based in State Offices and National Technology Support Centers around the country and will engage appropriate technical staff and other stakeholders in revising standards to meet soil health needs. They will provide training and technical assistance to field staff to build NRCS capacity to guide and incentivize producers nationally through technical services, decision tools, and cost-shared combinations of practices (SHMS), adjusted to soil health status (identified resource and soil health constraints), production system, climate, and other important producer/farm factors.
5. ***Evaluation, monitoring, and adaptation.*** Feedback and revision mechanisms will be identified and/or developed for gathering producer and service provider feedback, as well as new research findings from the literature and partners to guide continued improvement of Soil Health Division services and activities to better achieve implementation successes on a nationwide scale.

## **Barriers & Gaps**

Improve quantification techniques:

- **Adoption of practices:** Further investments are needed in understanding how NRCS conservation investments in soil health affect the larger agricultural community through ripple effects of producer successes inspiring adoption of new paradigms and

management practice systems among producers and their other agricultural service providers.

- **Quantification of changes in emissions and sequestration** due to varied practices and combinations of practices, across varied soil types, cropping systems, climates, etc

#### Research:

- Quantify and characterize the impacts of soil management practices (e.g., tillage, cover crops, crop rotations, soil amendments) across a range of soils, cropping systems, and climates on:
  - Yield, yield variability, crop quality and economics of crop production for each major cropping system and climatic zone.
  - Key soil health attributes (e.g. nutrient cycling, water availability, aggregation, disease and pest pressure, plant growth promotion) and/or soil physical, biological, and chemical soil properties/soil health indicators and processes.
  - Environmental outcomes (e.g. water quality/quantity, greenhouse gas emissions, etc)
- Quantify the extent to which measured values and rates of change of soil health indicators/attributes are influenced by climate, organic input chemical composition and placement, and soil management, across a range of inherent soil properties (e.g., particle size, mineralogy), cropping systems, and climates. This will aid in developing regionally adjusted indicator thresholds and soil health management recommendation systems.
- Develop optimal species mixes, seeding rates and seeding methods (e.g., inter-seeding, inter-cropping, frost-seeding) to enhance cover crop establishment/survival and increase soil organic matter, while maintaining or improving crop yields, specific to regions and cropping systems.
- Quantify the impacts of different types of grazing systems on soil health parameters, productivity, and economic outcomes, across a range of climates, soils, and livestock systems.
- Develop a Decision Support Tool that incorporates the above priorities to:
  - Provide information on current soil health status, and potential dynamic impacts of crop/cover crop residue quantity and quality parameters (e.g., cellulose, lignin, C/N), soil management practices, and inherent soil/climate/location factors;
  - Promote and inform design and implementation of SHMS; and
  - Result in practice recommendations and systems that are location- and cropping system-appropriate, economically viable, and effectively improve soil health/soil functioning (e.g. optimize nutrient availability, optimize productivity, control soil-

borne diseases, increase available soil water holding capacity, increase resilience to extreme weather).

## **Nitrogen Stewardship**

Nitrous oxide (N<sub>2</sub>O) emissions from crop nitrogen management practices depend on many factors, including the timing, source, placement, and quantity of nitrogen (both from organic and synthetic sources) applied. The right source, timing, placement and quantity of nitrogen applied is referred to the 4 Rs of nitrogen management. Furthermore, weather and soil health influence losses to the environment, and the resulting efficiency with which nitrogen is taken up by crops. N<sub>2</sub>O emissions from synthetic nitrogen fertilizers and organic sources represent a major source of GHG emissions from U.S. agricultural production. The emission of greenhouse gases can be reduced substantially through improved nitrogen management practices and increased nitrogen use efficiency on crop and pasturelands.

**Goal: Reduce N<sub>2</sub>O emissions by 7 MMT CO<sub>2e</sub> by 2025 by enrolling and/or maintaining 64 million cropland acres under nutrient management designed to mitigate N<sub>2</sub>O emissions.**

### **Primary Agencies**

**NRCS:** Provides technical and financial assistance to agricultural producers to develop and implement nutrient management plans, one goal of which is to reduce GHG emissions.

**ARS:** Conducts agricultural research and provides research data, tools, and information to NRCS and others on the technologies and management practices best suited to reduce N<sub>2</sub>O emissions.

**NIFA:** Provides technical and financial assistance to the Land Grant Universities and others to conduct research, education, and extension activities in agroecosystems (including forest and rangelands) to facilitate the reduction of GHG emissions.

### **Work Plan**

1. ***Recruit and train additional Technical Service Providers (TSPs)*** for direct technical assistance to producers and to develop and implement the 4Rs of nitrogen management.
2. ***Prioritize the use of the NRCS Conservation Activity Plan - Nutrient Management.*** This enables the producer, via an Environmental Quality Incentives Program application, to hire a qualified TSP to develop a Conservation Practice Standard (CPS) Nutrient Management Plan to reduce nitrogen emissions (ammonia, oxides of nitrogen).
3. ***Develop and maintain partnerships with agri-business professionals*** that are trained in nutrient management to assist with the planning and implementation of nutrient management with producers to mitigate GHG emissions by utilizing the 590 CPS Nutrient Management.

4. ***Assisting producers to maintain at least 75% of the acres adopted under nutrient management to stay under an approved nutrient management plan.*** This will require technical assistance from both NRCS and TSPs. The total acres under nutrient management to achieve the 7 MMTCO<sub>2</sub>e in 2025 will be 64 million acres. Nutrient management plans requires annual maintenance to remain effective, including new soil and plant tissue testing, updating yields and crops, and consulting with agronomists to keep the plan current. It is estimated to maintain acres to meet the nutrient management standard would cost the producer or NRCS (depends on who is providing the assistance) about \$6.00 per acre/year.

### **Barriers & Gaps**

1. Explore other means to assess the number of acres where nutrient management is applied and the geographic locations where nutrient management is being applied to the criteria of the NRCS CPS (590) Nutrient Management for both water quality and GHG emissions. This may be through partnerships with agri-businesses or more formal surveys.
2. Explore and provide additional information and education to the agri-businesses and producers to better understand carbon and nitrogen emissions and provide alternative strategies for mitigating carbon and nitrogen emissions from farming operations. This would require USDA NRCS, ARS, and NIFA to set up training via webinars and on-site training to the agri-business community.
3. Explore and continue research on improving farming technologies to reduce carbon and nitrogen emissions. Specifically, research is needed to tailor nitrogen management to different soil types, climate zones, and drainage systems.
4. Continue improving quantification techniques and further invest in understanding how NRCS conservation investments in nutrient management affect the larger agricultural community through ripple effects of producer nutrient application and agri-business impacts.



## **Livestock Partnerships**

Multiple livestock conservation technologies can positively impact GHG production and mitigation, including energy efficiency (EE) and renewable energy (RE) utilization. Each of these technologies may mitigate GHG production, though the degree of mitigation may also be dependent on many other factors. At the present time, the largest potential impact will be from the incorporation of anaerobic digesters (AD) with possible associated electricity generation and flaring from waste facility covers.

**Goal: Install 500 anaerobic digesters; install impermeable covers on 10% of dairy cattle and swine operations to reduce annual emissions by 21.65 MMTCO<sub>2</sub>e by 2025.**

## **Primary Agencies**

**NRCS:** NRCS administers the Environmental Quality Incentives Program (EQIP), which provides technical and financial assistance to producers to address resource concerns by installing and managing technologies on a voluntary, non-regulatory basis. The 2008 Farm Bill provided authority to address air quality and energy conservation resource concerns through EQIP. Although there is no direct authority to address climate change, many projects and practices funded through EQIP could have benefits for climate change.

**Rural Development and Rural Utilities Service:** Make grants and loans available to producers.

**ARS:** Conducts research and develops technologies that may address the problems of GHG mitigation from the livestock industries.

**NIFA:** administers grant programs that fund research, education and extension efforts among eligible stakeholders, including State Agricultural Experiment Stations, colleges and universities, university research foundations, other research institutions and organizations, Federal agencies, national laboratories, private organizations or corporations, and individuals.

## **Work Plan**

1. ***Recruit and train the additional NRCS and RD technical professionals and Technical Service Providers (TSP)*** needed to help producers install and operate AD and the associated electrical generation equipment.
2. ***Prioritize AD technology and the associated electrical generation technology in the EQIP and REAP rankings.***
3. ***Expand AD and other mitigation options and reduce the adoption costs of GHG mitigating technologies to increase accessibility to and demand for these technologies and practices.***

**Barriers & Gaps:**

Anaerobic digesters require significant upfront cost and initial investment, making them ideal candidates for public-private partnerships or innovative funding sources (e.g., green bonds). A priority could be engaging producer and industry groups for new frameworks for installing and maintaining digesters and other high-cost mitigation technologies. For example, a digester industry that installs and maintains digesters for multiple farms, a composting industry that collects and composts solids from multiple farms.

## **Conservation of Sensitive Lands**

The term “sensitive lands” denotes soils and landscapes that are valuable due to properties (e.g., high organic matter, wet hydrology) and/or function (e.g., wildlife habitat, filtration, hydrologic storage). For the purposes of these building blocks, sensitive lands are also those that have a large potential to reduce GHG emissions or sequester carbon. Typical examples of these soils are organic rich histosols, floodplains, or wetlands along riparian areas. Properties and functions of these soils are easily disrupted from agricultural or urban land use. Sensitive lands that are used for agricultural production can be protected by changes in land use (long-term cover) or land retirement programs. This reduction in land use intensity or retirement can provide multiple environmental benefits, including substantial GHG mitigation that occurs as carbon is sequestered or preserved in soils and vegetation. When land is retired, additional GHG mitigation is generated because activities such as tillage, fertilizer application, and energy use are substantially reduced or eliminated.

**Goal: Enroll 400,000 acres under the Conservation Reserve Program with high GHG benefits; protect 40,000 acres through conservation easements; transfer expiring CRP acres to permanent easement; total expected annual reductions of 0.81 MMTCO<sub>2</sub>e by 2025.**

## **Primary Agencies**

**FSA** and **NRCS**: Identify sensitive lands and encouraging landowners, farmers, and ranchers to voluntarily adopt conservation systems--using financial and technical assistance--to generate GHG benefits. FSA and NRCS have estimated the GHG mitigation associated with these conservation systems that may occur if applied to sensitive lands across the United States.

## **Work Plan**

1. ***Identify and target high-valued eligible lands*** to enroll additional riparian buffers, wetlands, and other conservation practices with large GHG mitigation benefits into the Conservation Reserve Program (CRP);
2. ***Extend benefits from CRP conservation by enrolling lands into permanent or long-term easements*** within the Agricultural Conservation Easement Program (ACEP), with State easement programs under the Conservation Reserve Enhancement Program (CREP), and with private partners;
3. ***Enroll organic soils used for crop production into CRP or wetland restoration easements under ACEP.***
4. ***Increase conservation actions on highly erodible lands (HEL) and wetlands*** as a result of conservation compliance provisions included in the 2014 Farm Bill.

### **Barriers & Gaps**

The primary barrier to increasing GHG mitigation benefits from CRP is the statutory limit on the number of acres that can be enrolled. The Agricultural Act of 2014 (P.L. 113-79) limited total CRP acreage in 2015 to 26 million acres, but decreases to 24 million acres by 2017 and 2018. On April 30, 2015, enrollment in the CRP was 24.3 million acres, including 811,000 acres of riparian buffers and 1.92 million acres of wetland and wetland buffer acres. Because current enrollment exceeds statutory limits set for 2017 and 2018, approximately 300,000 acres must exit CRP by 2017. Once the statutory limit is met, new acres enrolled will need to be balanced by land leaving the program. In 2016-2018, contracts covering a total of 7.2 million CRP acres will expire. Enrolling a large portion of these acres into conservation easements with high GHG mitigation benefits is the basis of this building block element.

Commodity markets also have a strong impact on CRP enrollment. For several years, corn and soybean prices were well above their long-term historical level, and the anticipated returns from crop production suppressed CRP enrollment. Commodity prices have retreated from these high levels, and greater interest in CRP enrollment may result.

## **Grazing and Pasture Lands**

The proper management of grazing lands, both range and pasture, can meet individual farm and ranch livestock production goals and play a role in nationwide efforts to increase soil carbon sequestration. The most important management decision affecting carbon sequestration is stocking rate (grazing animals/land unit/y); balancing animal numbers with forage supply insures optimal plant production and supply of carbon to soil microorganisms to maintain and increase soil carbon. Other adjustments to livestock grazing, such as season of use and distribution, can contribute to improved management, but the amount of available forage consumed by livestock is the overriding management control. Soil carbon sequestration can also be increased by restoring degraded land to perennial vegetation (Follett et al 2001). Restoration may either be via seeding native species and then extensively managing as rangeland or by planting improved species and intensively managing as pasture with additions of supplemental water and/or nutrients.

**Goal: Establish grazing management plans on an additional 9 million acres for a total of 27 million acres by 2025, leading to a projected annual reduction in GHG emissions of 4.6 MMTCO<sub>2</sub>e.**

## **Primary Agencies**

**NRCS:** NRCS provides quality assistance to the owners and managers of rangeland, pastureland and other grazed lands using appropriate science and technology to manage, enhance, and, where necessary, restore these grazing land ecosystems. Well-managed grazing systems improve the health and vigor of plants, enhance the quality and quantity of water, and reduce accelerated soil erosion and improve soil condition on the land. As a result, they can enhance the carbon storage in soil.

## **Work plan**

1. ***Increase the application of Prescribed Grazing (528)*** to range and pasture lands grazed by domestic livestock in appropriate regions. Prescribed Grazing requires the management of animal numbers, distribution, and season of use to meet conservation objectives, which may include soil carbon storage.
2. ***Maintain the application of Range Planting and Forage and Biomass Planting (550)*** at current levels and increase emphasis on Prescribed Grazing.
3. ***Conservation Field Trials*** to identify the potential of long-term uses of application of organic waste (compost) for carbon sequestration.

- 4. Promote and monitor land treated with Forage and Biomass Planting and ensure practices are maintained and managed, maximizing the land's carbon sequestration potential.***

#### **Barriers & Gaps**

The primary barrier to implementing a GHG mitigation plan based on the Prescribed Grazing, Range Planting, and Forage and Biomass Planting practices is that the dynamics of carbon flux between the soil and atmosphere are driven by year-to-year variation in climate and inherent regional differences in climate and soils. University and Agency research has repeatedly demonstrated the importance of climatic variability in determining carbon flux directions (+ or -) and rates on grass and shrub dominated systems. Good management can sequester more carbon in above average years and lose less carbon in below average years, but it cannot overcome the effects of weather.

A common barrier for the implementation of any land conversion practice is land and commodity prices. Thus, Range Planting and Forage and Biomass Planting are subject to the same constraints as practices such as CRP, where total costs of planting per acre may be prohibitively expensive.

## **Private Forest Growth and Retention**

The Forest Service administers two grant programs that support the retention of private forestland threatened by development. The Forest Legacy Program (FLP) identifies and protects environmentally important forestland threatened by conversion to non-forest use by acquiring conservation easements or fee interest in lands.

The Community Forest and Open Space Conservation Program (CFP) aims to secure a variety of community benefits through grants to local governments, Tribal governments, and qualified nonprofit organizations to acquire community forests through fee acquisition. By creating community forests, communities and Tribes are able to provide public access and recreational opportunities, protect vital water supplies and wildlife habitat, address the effects of a changing climate, provide demonstration sites for private forest landowners, and derive financial and community benefits from sustainable management. Projects are evaluated for the type and extent of community benefits, contribution to landscape conservation initiatives and the likelihood of conversion

**Goal: Protect almost 1 million acres of environmentally important private forestland from conversion, leading to a reduction in expected annual emissions of 4.82 MMTCO<sub>2</sub>e by 2025.**

## **Primary Agencies**

**US Forest Service:** The Forest Service is authorized through the Community Forest and Open Space Conservation Program to provide financial assistance grants to local governments, Indian tribes, and qualified nonprofit organizations (including land trusts) to establish community forests that provide defined benefits, and administers the Forest Legacy Program in cooperation with State partners, local governments and land trusts, recognizing the important contributions landowners, communities, and private organizations make to conservation efforts. Over 50 percent (over 420 million acres) of the nation's forests are privately owned.

## **Work Plan**

1. ***Protect additional acres of private forest land from conversion to non-forest uses through FLP and CFP.*** With current funding and programs:
  - FLP will prevent an additional 90,000 acres of private forest land from conversion annually.
  - CFP will prevent 1,775 acres of private forest land from conversion annually.

## **Barriers & Gaps:**

Land transactions are complex, and it is very challenging to project how long it will take to close a project. Once a project is awarded, it must go through a process of due diligence to ensure the appropriate use of federal funds; this includes title work, surveys, minerals

determination, and appraisals that meet federal appraisal standards. Delays are possible at any stage of the process. As such, projecting out accomplishments requires making many assumptions that impact the confidence of the projections.



## **Stewardship of Federal Forests**

Nineteen percent of all forestlands in the United States are National Forests. These USFS managed lands provide multiple benefits including timber, wildlife habitat, water quality, and recreational opportunities. The National Forests also currently serve as a major carbon sink. In 2013, they contained approximately 10,770 teragrams of carbon in forests and harvested wood products (HWP), which is 24% of the total carbon stored in all U.S. forests, excluding interior Alaska. National Forests annually sequester approximately 31.8 teragrams carbon per year for forests and HWP, which is 13.5% of total carbon stock change, a significant contribution to the mitigation of climate change. The USFS manages carbon by managing the health and adaptive capacity of our forests. The actions included within the Stewardship of Federal Forests Building Block are designed to recover, maintain, and enhance the resilience of the carbon sink associated with our National Forests through restoration/reforestation.

**Goal: Reforest 32,000 acres per year on National Forest System lands (baseline) for an expected annual reduction of 1.80 MMT CO<sub>2</sub>e by 2025.**

## **Primary Agencies**

**Forest Service:** The Forest Service takes significant steps to incorporate climate change in management and planning of National Forests, including the development of options that facilitate adaptation of natural resources to potentially deleterious effects of an altered climate.

## **Work Plan**

1. **Reforestation:** With additional funding, the USFS could ramp up reforestation efforts in areas severely affected by wildfires, insects and diseases, and other disturbances. We currently have 493,105 acres of identified planting needs not including the 2015 fire season. It would likely take a couple of years to carry out needed analysis and planning for increasing the pace and scale of reforestation, as well as to increase seedling production at USFS Nurseries. We have the basic infrastructure capacity to ramp up, but would need additional personnel at nurseries and at the forest/regional level in order to implement an increase in reforestation actions. Some deferred maintenance issues at the nurseries would also need to be addressed.
2. **Restoration:** The USFS has an initiative in place to increase the pace and scale of restoration treatments, which involves ramping-up restoration treatments to about 4.4 million acres per year. Opportunities to further increase restoration treatments exist as the number of acres in need of restoration is in the order of tens of millions. However, additional accomplishments will be difficult without additional funds.

### **Barriers & Gaps**

About fifty-eight million acres of national forests are at high or very high risk of severe wildfire. Out of the 58 million “high or very high” risk acres, we have identified approximately 11.3 million acres for highest priority treatment. These acres are in proximity to the wildland-urban interface or in priority watersheds or water sources, are in frequent fire return regimes, and not in roadless or wilderness areas. The USFS has identified 493,105 acres of post-disturbance planting needs.

Not all areas have equal potential to respond positively to restoration treatments or to planting. These actions would be most effective on highly productive sites. Accomplishment of treatments requires obligation of resources for planning, collaboration, documentation, implementation, and monitoring.

### **Promotion of Wood Products**

This building block focuses on increasing use of wood in buildings by increasing use of conventional wood construction technologies such as wood frame construction and by introducing mass timber construction, particularly Cross Laminated Timber (CLT), to the United States. CLT presents an historic opportunity to introduce a well-established technology that has profound climate implications. It has been demonstrated worldwide to be a cost effective sustainable alternative to conventional concrete and steel construction particularly in the mid-rise to low high-rise building spaces. Most building construction in those ranges emits considerable amounts of carbon, mainly in the creation of concrete. CLT buildings have been evaluated as being carbon negative for decades. Not carbon neutral; carbon negative. They entail the direct sequestration of carbon through the use of massive amounts of wood within buildings. Thousands of CLT buildings have been built worldwide mainly due to the cost savings associated with them. At this time there are only about a dozen very small CLT structures in the US. Our plan is to change that dramatically.

The main challenges today are the lack of commercial production of CLT in the US, reluctance to build production capacity while the market is developing, and other barriers such as building code limitations.

**Goal: Increase the number of building projects supported through technical assistance from 280 in 2014 to 2,000 in 2025; expected annual reductions of 19.5 MMTCO<sub>2</sub>e**

### **Primary Agencies**

**USFS:** In 2011, Agriculture Secretary Tom Vilsack announced a new USDA strategy to promote the use of wood as a green building material. The US Forest Service (FS) is the lead agency in implementing the following goals: 1) increase the use of wood in USDA construction projects, 2) increasing research on the use of wood products as a green building material, 3) demonstrate the innovative use of wood as a green building material, and 4) Develop and support partnerships for using wood in federal government, private, and NGO sectors.

### **Workplan**

We are addressing the lack of CLT production in the US through several means, including:

- Sponsoring a feasibility analysis by SmartLam in Montana to evaluate adding an architectural grade CLT line to their current industrial matting CLT line;
- Funding an Oregon State University assessment of the use of small diameter material for CLT production which could open up new sources of hazardous fuels to commercial use;

- Working with Clemson University to determine the behavior of southern yellow pine in CLT applications;
- Underwriting and helping design a wide-ranging National conference on “Mass Timber” in Portland, Oregon in March 2016 (Mass Timber includes CLT and related technologies);
- Retaining partners to conduct “dynamic blast tests” to compliment computer modeled blast testing already conducted on behalf of the Department of Defense, which could open up defense related applications of CLT;
- In partnership with the Softwood Lumber Board we are creating the first interactive database on CLT research with an eye to making what we know at any given moment more accessible to specific audiences such as developers and code officials;
- Providing primary underwriting to WoodWorks which in turn provides training and project specific technical assistance to architects, engineers, developers, and code officials;
- Hosting a California specific CLT conference to look at the potential for modifying existing mills in California to produce CLT targeted at the need for earthquake resistant retrofitting in that state in October 2015; and
- Continue engaging and supporting the U.S. Tall Wood Building competition process.

To address the challenges presented by existing construction codes in the US we are financially backing code revision process work being conducted by the American Wood Council and providing subject matter experts. We have spent considerable time influencing influencers such as the US Green Building Council. USGBC sponsors the LEED certification program, which until recently effectively discriminated against wood. Our time with them has paid off. They recently released a thought piece promoting CLT.

### **Barriers & Gaps**

Additional Potential Actions to Reduce Emissions or Enhance Carbon Storage:

- Organize staffing to concentrate on this focus.
- Engage other Executive Branch Agencies such as the General Services Administration and the Department of Defense in aggressive use of CLT.
- Support the creation of a CLT industry through such means as contributing to feasibility studies.
- The potential benefit of associating with the Climate Hubs is unknown. At this time, the staffing dedicated to this effort is nominal and there is a concern that coordination with the hubs may add work expectations on the few involved in making this work happen without a proportionate benefit from establishing that connection.

- Going forward, USDA could play a key role in conducting detailed fire and earthquake resistance testing. Compelling testing has been done around the world but our domestic code processes essentially call for repeat testing under the control of the US.

## **Urban & Community Forests**

The Energy Saving Trees program, executed through the Arbor Day Foundation and local utility companies, encourages homeowners to plant trees in energy saving locations around their homes. Since July of 2011, the Energy Saving Trees program has engaged more than 70,000 homeowners to plant more than 125,000 trees, leveraging more than \$2.7 million in funding from electric utilities. These figures include 25,284 trees planted and 16,496 homeowners engaged in the spring of 2015; fall 2015 plantings have yet to begin. The program has engaged 22 utilities in 21 states and the District of Columbia. These tree plantings have saved more than 275,000 MWh of power and more than 4,000,000 therms of natural gas, and sequestered more than 282,400 metric tons of carbon.

**Goal: Plant 100,000 additional trees in urban areas by 2025; expected annual reductions of 0.0036 MMTCO<sub>2</sub>e**

## **Primary Agencies**

**USFS:** The Forest Service's Energy-Saving Trees partnership program is an innovative, strategic tree planting initiative that engages partners in the urban forestry community to support the planting of trees in locations specifically chosen to reduce carbon emissions from energy plants by reducing energy consumption in homes and businesses.

## **Work Plan**

1. ***Departmental level engagement with state governments could help to shift these policies in favor of energy-saving tree plantings, opening up new potential partnerships for the Energy-Saving Trees Program and leading to a larger number of trees planted.*** Next steps in pursuing this would include identifying key points of contact in states where these policies are currently a barrier, and reaching out to them to discuss the merits of such a policy shift. Some of this work is already occurring with the Secretary of Agriculture.
2. ***The Forest Service's Urban and Community Forestry (UCF) Program is implementing a core program and pursuing partnerships that will have impacts on carbon storage.*** Through our core program, implemented through the Regional Offices and the states with funding allocated by Congress each year, we are providing technical assistance, conducting tree canopy assessments, and planning for future tree planting. This work to maintain and enhance the current urban canopy across the country will have long term carbon sequestration impacts both through the trees that are kept healthy and alive, therefore continuing to store and sequester carbon, and through the planting of new trees.

3. ***The new Landscape Scale Restoration program focuses and prioritizes funds and resources to better shape and influence forest land use on a scale, and in a way, that optimizes public benefits from trees and forests for current and future generations.***  
This program funds competitive projects that focus on all lands and result in a targeted, positive impact in high-priority areas by leveraging State capacity with strategic Federal investments. Some projects funded through this program will include urban canopy maintenance and enhancement, further enhancing carbon storage across our nation's urban landscapes.
4. ***The UCF program is pursuing innovative partnerships that will further enhance carbon storage.*** For example, the Forest Service supports community grant making for restoration projects via the National Fish and Wildlife Foundation. Projects improve neighborhoods, restore watersheds, and enhance the health of urban and rural forests, in communities nationwide, across all lands. Federal support is leveraged by private contributions and matching support from local grantees. Grant programs that receive Forest Service funding include the Urban Waters/5 Star Restoration Fund, the Longleaf Stewardship Fund, the New England Rivers and Forests Fund, Chesapeake Bay Program Small Watershed Grants Program, Sustain Our Great Lakes Program, and more. These existing programs are a ready vehicle for delivering tree planting and restoration activities that increase carbon sequestration.
5. ***The UCF program is pursuing interagency partnerships that will lead to more tree plantings in communities across the country.*** For example, working with the Environmental Protection Agency's Office of Water, we are piloting partnerships in five states that will direct Clean Water State Revolving Funds (SRF) to Green Infrastructure and tree planting work. In most of these pilots, state Urban and Community Forestry personnel will serve as technical experts, helping applicants for the SRF integrate green infrastructure work into otherwise gray infrastructure projects. Through this partnership, municipalities and partners planning tree planting and green infrastructure work will have access to the roughly \$1 billion appropriated into the SRF each year, funds previously not used or under-utilized for tree planting.

### **Barriers & Gaps**

Key barriers to larger scale adoption of the Energy-Saving Trees Program are policies set forth by the Public Utility Commissions in each state. These commissions are responsible for determining what expenses are eligible for funding with a utility's energy efficiency dollars. While a few states allow these funds to be spent on tree planting, many do not, restricting funds available for programs like Energy-Saving Trees.

## **Energy Generation and Efficiency**

### **Energy Efficiency for On-Farm Operations**

Energy efficiency is a measure of fuel and electricity consumption per unit of output.

Efficiency improvements can be achieved on-farm by:

- Increasing efficiency of equipment, such as motors, pumps, or lighting;
- Decreasing consumption of energy through improvements of building heating, cooling, and ventilation systems;
- Avoiding the use of energy through better control of systems using timers, sensors, and variable speed drives; and,
- Change in management or timing of farm equipment operations.

Increasing energy efficiency produces direct (on-farm fuel combustion) and indirect (off-farm power generation) greenhouse gas (GHG) emissions reductions by decreasing the consumption of fossil fuels. The type and amount of fuel used to power agricultural operations varies widely by farm enterprise type, size, age, and location.

### **Rural Utilities Service Electric Program**

The Rural Utilities Service Electric Program funding will be available to finance the construction of new generation facilities and systems. To support the reduction of GHG emissions from electric facilities owned by RUS borrowers, much of this funding is expected to be used to replace the aging fleet of fossil fuel-fired electric generation facilities with generation plants that operate cleaner and more efficiently. The construction of new RE resources and new natural gas-fired combined cycle (NGCC) units are both expected to play an integral role in replacing old coal-fired plants as well as in meeting growth in the demand of electricity. These actions will modify the energy supply portfolio of RUS Electric Program borrowers to include more zero and low carbon dioxide (CO<sub>2</sub>) emitting resources. RUS funding will also be made available to finance equipment upgrades, system improvements and modifications at existing generation facilities.

In addition, RUS financing will be made available to eligible borrowers to implement system improvements at existing electric transmission and distribution (T&D) systems to make these systems operate more reliably and more efficiently. RUS funding will also be made available to build new or expand existing T&D facilities to allow these systems to operate more reliably and more efficiently and also to provide increased access to newly constructed generation facilities including renewable energy (RE) resources such as wind farms and solar power plants.

The RUS Electric Program also provides funding to support demand-side management, energy efficiency (EE) and conservation programs, and on-grid and off-grid RE systems. As an



incentive to expand the use of RE resources and to promote demand-side EE and conservation programs in rural areas, RUS issued the Energy Efficiency and Conservation Loan Program (EECLP) final rule on December 5, 2013.

### Rural Housing Service

USDA's Rural Housing Service offers a variety of programs to build or improve housing and essential community facilities in rural areas. RHS offers loans, grants and loan guarantees and provides technical assistance loans and grants in partnership with non-profit organizations, Indian tribes, state and federal government agencies, and local communities. These financial assistance programs can sometimes be used to promote energy efficiency if economically feasible.

**Goal: Promote renewable energy technologies and improve energy efficiency throughout the Rural Energy for America Program (REAP), the Energy Efficiency and Conservation Loan Program (EECLP), the Environmental Quality Incentives Program, and Rural Housing Service programs.**

### Primary Agencies

**NRCS, Rural Development and the Rural Utilities Services (RUS) Electric Program**

### Work Plan

1. ***NRCS has provided financial and technical assistance for energy efficiency since 2009.***  
Since FY12 there has been a national initiative that requires all states have a separate fund pool for energy efficiency so that these applications are ranked only against other energy applications within the state. It is anticipated that the national initiative will continue through 2018.
2. ***Electric Program staff will continue to perform outreach activities but will place more emphasis on promoting RE and EE programs*** and educating both existing and potential new borrowers on the types of programs and funding that the Electric Program can offer.
3. ***RUS will continue to prioritize loan applications for new RE resources, demand-side EE programs, and system improvement projects at existing facilities that are needed to meet environmental compliance standards.***
4. ***RUS will work to ensure that the Budget Authority for Electric Program in the future:*** i) continues to provide support to finance RE resources, ii) provides funding to support for the construction or purchase of NGCC units at all load factors (peaking, intermediate, and baseload) and iii) provides funding to support for systems improvements at existing fossil-fuel facilities including coal-fired units.

5. ***Develop baseline data and a data collection plan*** to estimate the amount of energy savings and greenhouse gas emissions reduction from *the Multifamily Preservation and Revitalization Demonstration Program (MPR) and the Farm Labor Housing program.*
6. ***Roll out national multifamily energy efficiency study and pilot energy efficiency retrofits in 3 RHS-financed properties.*** Use pilot to identify most cost-effective energy efficient improvements in various climates and property types and explore funding options to finance improvements such as partnerships with cooperatives to utilize Energy Efficiency and Conservation Loan Program (EECLP.)
7. ***Roll out new eTool for Capital Needs Assessment (CNA).*** When this tool is fully functional, and after both agencies have made its use mandatory for MPR borrowers, it will facilitate data queries on housing trends related to materials and technology, energy efficiency improvements to properties, and construction cost comparisons and analysis.
8. ***Explore incentives to encourage inclusion of energy efficiency improvements across the RHS loan, grant and guarantee portfolio.***
9. ***Explore tracking of number of SF Direct loans that include green or energy efficiency features along with loan performance.***
10. ***Explore tracking of CF loans that include energy efficiency features in essential community facilities.***
11. ***Improved training for RD field staff on energy efficiency requirements and opportunities across the RHS portfolio.***
12. ***Improved marketing of energy efficiency incentives available through RHS programs to owners/purchasers and other stakeholders.***

### **Barriers & Gaps**

- Training on energy efficiency topics for NRCS field staff has been limited. Although there have been numerous webinars provided through the NRCS National Technical Support Centers, these are not sufficient to prepare field staff for a completely new area of responsibilities. Nationally, there are very few staff dedicated to work exclusively on energy efficiency for the agency. Due to these limitations, outreach and information that would increase technical assistance is not widespread. Field staff that are responsible for promoting programs and ensuring that practice implementation meets NRCS standards are not experienced with energy efficiency and are often reluctant to discuss opportunities with producers.
- The USDA Climate Smart GHG reduction portfolios identify agency programs and potential outcomes. While EE may be a desired outcome for farmers and ranchers, barriers exist for using available programs:

- Producers are unaware of available programs, or are confused about which programs to use.
  - Producers often underestimate the economic benefits of energy efficiency, or feel that the benefit is too little for the time they must invest to achieve it.
  - Loans for facility improvements and project implementation may be difficult to secure.
  - There may be a lack of administrative and technical guidance to help farmers with decision-making and program commitments.
  - Agricultural producers have limited time to plan and install conservation projects; program paperwork and deadlines cause frustrations that exacerbate the likelihood of procrastination by the farmer.
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- Costs: RHS does not have a standard estimate of what costs are to retrofit existing stock or finance green premium via new mortgages.
  - Affordability: RHS serves a low to moderate-income population, with multifamily units serving primarily extremely low-income households earning at or below 30% of the median income in their region (AMI), and the single-family guaranteed loan serving up to 115% AMI. The ability of these homebuyers and renters to pay higher housing costs upfront for energy efficiency improvements is limited. There could be a possible increase in Rental Assistance costs to pay for green retrofits.
  - Climate/geography: RHS-funded housing and community facilities are located across the country in diverse climates, affecting energy performance and needs. Further study is needed to identify how these differences and climate and geography will impact the ability of RHS to increase energy efficiency in different regions.
  - Property age: older properties used outdated building methods and more likely have poor energy efficiency while being more costly to retrofit.
  - Building codes: some rural communities lack proper building codes and/or enforcement, as well as the capacity to overcome obstacles, especially in remote and small rural communities lacking proper infrastructure.
  - Financing green premium – there may be statutory limitations, or there may be tradeoffs within a finite resource e.g. choice between financing more loans for low-income households without energy efficiency improvements versus financing energy efficient improvements on a smaller number of loans.